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## BUTTON CLOVER.

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### INTRODUCTION.

Button clover[1] is native to the Mediterranean region of the Old World and was introduced into the United States in 1899 by the Office of Foreign Seed and Plant Introduction. Since then, several other small lots of seed of this clover have been obtained from this same region, but practically all the experimental work done has been with seed increased from an introduction made in 1902.[2] Button clover has been tested most extensively in California, where it has proved especially well adapted. In the Southern States it has not been tested extensively enough to determine definitely its value, but the work done indicates that it can perhaps be used successfully in all the milder sections now growing the spotted or southern bur clover.

### DESCRIPTION OF BUTTON CLOVER.

Button clover is an annual. It makes a decumbent or trailing growth, ascending only when in a thick stand. The stems attain a

[1] *Medicago orbicularis.*

[2] This introduction is S. P. I. No. 10725, being seed secured in Algeria by Mr. T. H. Kearney.

length of 24 to 48 inches and are rather slender and branched but little. The plants produce a number of stems, but in this respect they vary considerably, depending mainly on the thickness of the stand. Usually the stems are quite leafy throughout their entire length. There is a marked similarity of the leaves to those of ordinary clover, the leaflets being rotund or obovate. In general, the flowers resemble those of alfalfa, but differ in being a little smaller and borne two in a place instead of many and in being yellow instead of purple, the most common color in alfalfa. The seed is about the size of alfalfa seed and is borne in a tightly coiled lentil-shaped pod one-half to 1 inch in diameter. (Fig. 1.)

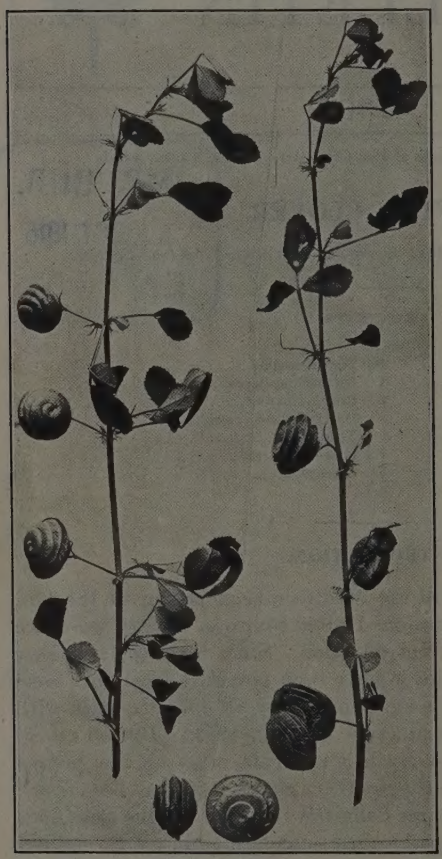

FIG. 1.—Stems of button clover, showing the large spineless pods. (One-half natural size.)

## SIMILAR SPECIES.

While button clover is but little known in most parts of the United States, there are several similar and closely related plants that are quite common and well known. The toothed or California bur clover [1] and the spotted or southern bur clover [2] are well-known species that are closely related to button clover and resemble it in general appearance and manner of growth. The most noticeable difference between the button clover and the others mentioned is in the pods or burs. The burs of button clover are large and spineless, while the others have comparatively small and spiny burs. Yellow trefoil [3] and alfalfa [4] belong

[1] *Medicago hispida denticulata.*
[2] *Medicago arabica.*
[3] *Medicago lupulina.*
[4] *Medicago sativa.*

to the same genus of plants as button clover, and while yellow trefoil is more or less like button clover in its manner of growth and general requirements alfalfa is quite different.

## CLIMATIC REQUIREMENTS.

While button clover, if sown in the spring, can be grown as a summer crop in sections having cold winters, it can be grown to advantage only where the climatic conditions are so mild that it can be used as a winter annual. As such it is not adapted to sections having a winter temperature below 18° F. above zero, and it will not establish itself and reproduce spontaneously under a much lower temperature. Aside from being unable to withstand extreme cold, button clover does not do well in extreme heat. A growing period

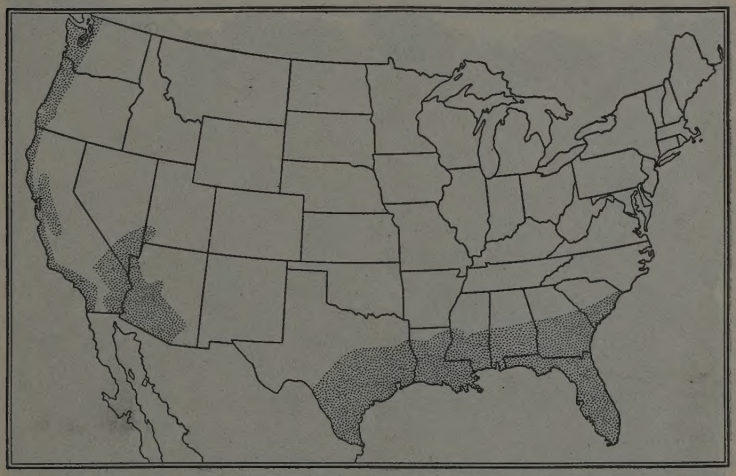

FIG. 2.—Outline map of the United States, the shaded portion showing the areas where the climatic conditions are favorable to the production of button clover.

having no extremes of temperature is essential for the best results. The accompanying map (fig. 2) shows the areas of the United States in which temperature conditions are favorable to this crop.

## SOIL AND MOISTURE REQUIREMENTS.

In testing button clover in comparison with spotted and toothed bur clovers it has been found that its requirements as to soil and moisture conditions are practically the same as for those crops. While it does best on fairly well drained rich loam soil, it can also be grown on almost any soil containing sufficient moisture. It will make a fair growth under rather arid conditions, but in the dry foothill pastures of California it has done no better than the common toothed bur clover. On heavy, moist, low lands it has done well, equaling spotted and toothed bur clovers.

## VALUE FOR PASTURAGE.

The principal value of button clover is for pasturage. It is well suited for this purpose, and in the bur-clover sections or sections having a mild winter climate it will make a valuable addition to the present pasture plants. Under favorable conditions it makes a heavy growth (fig. 3) and produces much more seed than bur clover. Under less favorable conditions the growth is correspondingly less, but it will succeed wherever bur clover does well. Button clover makes good pasturage when in the green state and, like bur clover, it is

FIG. 3.—A field showing a heavy growth of button clover mixed with wheat at Chico, Cal.

readily eaten by live stock. Its unique value lies in the fact that it produces a larger quantity of seed than the spotted or toothed bur clover and that it has no spines on the pod, or bur. The pods ripen in early summer and drop from the vines. In their ripened state they are then available at any time as food for stock. This is especially true in the southwestern portion of the United States, where the summer season is practically without rainfall. Button clover, being similar to bur clover and alfalfa, may sometimes cause bloat in cattle and sheep when fed in the green state, and care should be taken in turning stock into such fields for the first time. This trouble is most likely to be experienced in early spring, when the plants are very succulent. It is also essential that button-clover pastures should

not be grazed too closely in the late spring, as with close pasturing, especially with sheep, most, if not all, the large burs will be eaten in the green state and but few, if any, of the seeds will reach maturity. In order to maintain a stand of button clover, some of the pods must be allowed to mature each season. Button clover is to be preferred to spotted or toothed bur clover for introduction on ranges where sheep are pastured. The great loss of wool occasioned by the spiny burs of the last two species getting into the fleece is evidence, to any one familiar with such conditions, of the value of a species with a spineless pod.

The superior value of button clover has been recognized for some time in Australia, where it is now quite common in several regions. In 1905 the advantage of spineless bur clover was pointed out by calling attention to the great loss sustained by the wool producer on account of spiny burs.[1] Fleeces from districts producing spiny bur clovers in abundance often contain as much as 25 to 30 per cent of burs. This not only means loss by reason of lower prices paid for the burry product, but also on account of extra freight. The Agricultural Journal of Cape Colony, South Africa, for September 7, 1893,[2] reported the receipt of seeds of button clover and snail clover, a similar species, from Baron von Mueller, who, in transmitting them, wrote: "They are annual, but produce an immense number of fruits, which the sheep lick up and eat when pasturage fails. I have gathered as many as 1,400 seeds from a single plant." In January, 1894, J. H. Maiden[3] referred to Von Mueller's statement regarding these plants and states that "he [Von Mueller] has been the means of distributing both plants in many Australian localities in which it now flourishes." Spiny bur clover, however, has spread more rapidly in Australia than button clover, but the latter is not uncommon, occurring abundantly in various localities, and seed is now advertised for sale by Australian seedsmen.

## VALUE FOR HAY AND GREEN MANURE.

Button clover makes good hay that is readily eaten by all kinds of stock. For hay of the best quality, it should be cut when most of the pods are still green but well developed and just before the leaves begin to fall. When allowed to become more mature, many of the pods as well as the leaves are lost in handling and the value of the hay is greatly reduced. In growing for hay, a supporting crop of oats or barley or some other grain should be sown with the button clover, in order to facilitate cutting. The decumbent habit of

[1] Burrless clover. *In* Agr. Gaz. N. S. Wales, vol. 16, pt. 1, pp. 76–78, illus. 1905.
[2] Useful fodder plants. *In* Agr. Jour. Cape Colony, vol. 6, no. 18, pp. 335–336. 1893.
[3] Maiden, J. H. Two fodder plants interesting to the woolgrower. *In* Agr. Gaz. N. S. Wales, vol. 5, pt. 1, pp. 5–6, 1 pl. 1894.

the plant makes this desirable, and aside from this the mixture, consisting of grain and button clover, makes excellent feed. The use of button clover for hay production will no doubt be very limited, as there are other legume crops that are more desirable for this purpose. However, its habit of growth and not its feeding value as hay is the factor limiting its use. The value of button clover for green manuring is about the same as toothed and spotted bur clovers.

## INOCULATION.

It is common to find nodules of various forms on the roots of nearly all legumes. These nodules are caused by bacteria or microorganisms that live upon the roots of the plants. The bacteria are beneficial to the plant upon which they live, as they take nitrogen direct from the air and make it available for the use of the plant as food. With many plants it is essential for their best growth that these bacteria be present, and in soils where they do not occur naturally or in sufficient numbers they must be supplied by artificial means when a crop is grown for the first time. The supplying of these bacteria to a soil is known as inoculation. In the parts of the Pacific Coast States where bur clover is now common, inoculation is not necessary for button clover. In places where bur clover does not occur, and particularly in places where alfalfa does not do well, inoculation is usually essential. In the Southern and Gulf Coast States inoculation is advised except on land that has previously grown bur clover.

One of the easiest methods of inoculation is to mix a small amount of soil from an old bur-clover field with the seed, whether hulled or in the bur, immediately preceding planting. The quantity of soil used need be only a mere dusting. Inoculation can also be accomplished by scattering soil from an old bur-clover field over the area to be seeded. This should be done immediately prior to sowing the seed. Sowing seed in the bur seems also to insure inoculation, and for this reason it is commonly practiced in the Gulf Coast States with spotted or southern bur clover. Open and loamy soils are the most easily inoculated, and it is recommended that in growing button clover on a place for the first time an old garden patch or other well-prepared and manured piece of land be selected. In the absence of inoculated soil, inoculation may be secured by the use of artificial cultures.

## TIME OF SEEDING.

In sections having a mild winter climate, button clover should be sown in the fall. Where summer rains occur, as in the Southern States, the seeding should be done about the first of September. Early summer seeding in the Cotton States is not advisable, as the young plants starting at that time are liable to suffer from drought,

and where a heavy growth is made the plants tend to mature and die rather than continue growth through the winter. In California, where dry weather prevails throughout the summer, the seed may be sown at any time before the fall rains begin. When it is desirable to start the seed in the fall with irrigation, the seeding should be done about the first of October. The object is to sow the seed so late that a subsequent irrigation will not be necessary.

### ESTABLISHING IN PASTURES.

In sowing button clover in pastures, little more can be done than to scatter the seed in the most favorable places, but attention should be paid to the time of seeding and also to inoculation. In pastures that can be cultivated, a working of the soil prior to sowing will, perhaps, be found advantageous in establishing a stand, but except on good lands this will hardly be profitable. The soil should be worked very lightly, if at all, after seeding, as the seed of button clover will not germinate readily when given more than a very light covering. On most pasture lands about all that can be done profitably is to sow the seed broadcast and allow it to compete with the other pasture plants. In pasturing button clover, care should be taken to see that seed is allowed to mature each season, or at least every other year, in order to maintain the stand.

### GROWING FOR SEED.

The growing of button clover as a seed crop on a large scale is most practicable in sections having a continuous dry summer. California, apparently, has more favorable conditions for growing button-clover seed than any other State. Before seeding, the land should be put in as good condition as possible by plowing and harrowing, and if the seed is to be harvested by sweeping or by a similar method the field should be run over with a float or roller to leave a smooth surface, in order to facilitate the harvest. If a drill is used to sow the seed, the ground should be especially well firmed, as otherwise the seed will be planted too deep. The clean seed may be sown broadcast or by using an ordinary grain drill with a press-wheel attachment. Special care should be taken to give the seed but a light covering. The press-wheel attachment is necessary for the best success when a drill is used. In general, broadcast seeding will perhaps be found the most satisfactory. A light harrowing is all that is necessary to cover the seed sufficiently. When the land is left with light furrow markings, such as are made by a large-toothed harrow, the seed not covered by the harrow at the time of seeding will fall into these small furrows and be covered by the washing of subsequent rains. Good stands have been secured by this method without covering the seed at all at the time of sowing, and it probably will be found satisfactory in all sections where rains are frequent at seeding time.

## HARVESTING AND THRASHING.

The harvesting of button-clover seed is rather difficult on account of the decumbent habit of the plant and because the burs fall from the vines so easily. The use of ordinary farm machinery has not been found satisfactory, and sweeping the burs together, a method used in various sections with spotted and toothed bur clovers, is perhaps the most satisfactory for general use. The practice when harvesting in this way is to allow the seed to ripen thoroughly and then to cut the vines with an ordinary mowing machine and rake them into windrows. The burs are then swept together with large barn brooms and hauled from the field. The burs gathered in this manner are mixed with more or less gravel and other foreign substances, which must be removed before the seed can be hulled satisfactorily or used in the bur. This separation is accomplished by the use of handbarrow screens and an ordinary fanning mill regulated to blow the burs over, or if running water is handy, a quicker and more satisfactory method is to throw the burs into the water. All heavy substances sink, and the burs and lighter substances are then dipped from the stream. To facilitate this method of separation the channel of the stream should be narrowed in the shape of an open V, which generally aids in collecting the cleaned burs. To dip the burs from the water, a large handbarrow with a bottom made of wire netting has been found very satisfactory. The burs are spread on canvas to dry, after which they are ready for the huller. An ordinary clover huller separates the seed satisfactorily.

## YIELD OF SEED.

In comparison with the spotted and toothed bur clovers, button clover produces a large amount of seed. In Table I are given the yields secured at Chico, Cal., from plantings one-twentieth of an acre or larger. In the 1908 test the plats were grown without irrigation. In 1909 and 1910 the plats were irrigated in the fall prior to planting, but no subsequent irrigation was given. The comparatively large yields of the button clover have been very consistent in all of the tests. Hulled seed of button clover weighs about the same as alfalfa seed—60 pounds to the bushel. Seeds in the bur weigh about 8 pounds to the bushel and a bushel of burs contains about 2½ pounds of seed.

TABLE I.—*Yield of seed per acre of button clover and toothed bur clover at Chico, Cal., from 1908 to 1911, inclusive.*

| Kind of clover. | Yield per acre of hulled seed (pounds). | | | |
|---|---|---|---|---|
| | 1908 | 1909 | 1910 | 1911 |
| Button clover | 860 | 790 | 1,160 | 947 |
| Toothed bur clover | 407 | 407 | 255 | ..... |

## LONGEVITY OF SEED.

The length of life of the seed of button clover no doubt varies somewhat, depending upon the conditions under which it is kept. Tests made in various years with several lots of hulled seed stored in ordinary warehouses show that after three years the percentage of germination will be reduced to about one-half. Tests made in 1915 with seed grown in 1912 showed a germination of 58 per cent, with 2 per cent of hard seed. Seed grown in 1907 germinated 49.5 per cent, with 5 per cent of hard seed, when 4 years old, and 29.5 per cent, with 7 per cent of hard seed, when 7 years old. In 1911 a test made with seed grown the previous year gave a germination of 91 per cent, with 4 per cent of hard seed.

## CONCLUSIONS.

Button clover is an annual plant similar to spotted and toothed bur clovers.

It is native to the Mediterranean region of the Old World, whence it was introduced into the United States.

A mild climate with a winter temperature not lower than 18° F. above zero is necessary for its best development.

It is not exacting as to soil and moisture requirements and succeeds under quite varied conditions.

As a pasture plant, button clover is especially valuable in the milder districts of the southwestern United States, where it is to be preferred to spotted and toothed bur clovers.

It is easily established in pastures, as it needs no other treatment than the scattering of the seed where desired.

Inoculation is essential in districts where the nodule-forming bacteria are not already in the soil.

Button clover makes good hay, but it is difficult to handle as a hay crop on account of its decumbent habit.

A good seed crop is usually produced, but the harvesting and thrashing of the crop are made difficult on account of the pods dropping easily from the stems.

The value of button clover for green-manuring purposes is practically the same as spotted and toothed bur clovers.

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